# Improvement in Seed germination and growth parameters in *Murrayakoenigii* (L.) spreng using different growing media

**Abstract :**

The experiment was conducted to determine the effect of different growing media on seed germination and growth parameters of *Murrayakoenigii* (L.) Spreng under glass house conditions at Dr. YS Parmar university of Horticulture and Forestry, Nauni, Solan Himachal Pradesh. The experiment consisted of seven treatments (growing media) viz., $S_1$: Soil (Control), $S_2$: Soil + FYM (2:1), $S_3$: Soil + Vermicompost (2:1), $S_4$: Soil + Coco peat (2:1), $S_5$: Soil + Sand + FYM (1:1:1), $S_6$: Soil + Sand + Vermicompost (1:1:1) and $S_7$: Soil + Sand + Coco peat (1:1:1) with three replications.Observations were recorded on Germination percentage (%), Initiation of germination (days), Completion of germination (days), Mean daily germination (%), Peak value, Germination value, Seedling root length (cm) and Seedling shoot length (cm). The growing media of (Soil + Sand + Vermicompost) in ratio (1:1:1) exhibited maximum value for seed germination and growth parameters viz., maximum germination percentage (86.00 %), early initiation of germination (10.00 days), early completion of germination (20.33 days), peak value (6.35), mean daily germination (4.26 %), germination value (27.15), seedling shoot length (17.60 cm) and seedling root length (18.90 cm). However, the minimum value for all germination and growth parameters was recorded in control.

**Keywords:***Murrayakoenigii*, Growing media, Germination, Vermicompost



## Introduction

Throughout history, plants have served as medicinal remedies across the globe for millennia. Today, the World Health Organization (WHO) reports that approximately 80% of the population, particularly in developing nations continue to depend on plant-based medicines for their primary healthcare needs. India, for instance, embraces diverse medicinal systems like Ayurveda, Siddha, Unani, Amchiand local health traditions, all of which prioritize the use of plant-derived products for healing both human and animal ailments.

Medicinal plants harbor a wide array of biologically active compounds that play a crucial role in treating various diseases and enhancing human well-being. Besides serving as a rich source of anti-infective agents, these plant-based remedies are cost-effective and tend to have fewer adverse side effects (Nayak ,2006; Samsam and Mortar ,1991).

*Murrayakoenigii*, sometimes referred to as curry leaf or karipatta in some Indian dialects, is a member of the Rutaceae family, which has more than 150 genera and 1600 species (Sangam *et al.,* 2015). Over the course of centuries, this plant has been utilized in various forms and holds a prominent position in Indian Ayurvedic medicine, where it is commonly referred to as "krishnanimba."(Ahluwalia *et al.,* 2004). The plant is credited with tonic and stomachic properties. Bark and roots are used as stimulant and externally to cure eruptions and bites of poisonous animals. Green leaves are eaten raw for cure of dysentery and for checking vomiting. Leaves and roots are also used traditionally as bitter, analgesic for curing piles, inflammation, itching and are useful in leukoderma and blood disorders (Jain *et al*., 2012).It is also known in Ayurveda as medicine for its variety of pharmacological activities like anti-cancer, anti-oxidant, anti-inflammatory, anthelmintic, anti-diabetic and anti-microbial activity.

Curry leaf (*Murrayakoenigii*) is normally propagated by seeds. The freshly harvested seeds give maximum germination but they lose their viability very quickly in storage under open conditions (Ranganathappa*et al.,* 2001).The utilization of an appropriate growing medium is crucial for producing high-quality seedlings, as it directly influences the establishment and subsequent maintenance of a robust and efficient root system. A suitable growing medium not only provides adequate support for the plant's anchorage but also acts as a reservoir for essential nutrients and water. Furthermore, it facilitates the diffusion of oxygen to the roots and enables gaseous exchange between the roots and the atmosphere surrounding the root substrate (Abad *et al.,* 2002). The use of high-quality and sustainable nursery potting media has a positive impact on the production of superior-quality seeds (Agbo and Omaliko, 2006).

The role of growing media is crucial in facilitating the germination of seeds. Serving as a substrate, it furnishes essential elements and the necessary physical foundation for the seeds. Growing under organic conditions is particularly desirable, especially for medicinal crops, because such crops are devoid of dangerous chemical pesticide residues. The media should possess favourable attributes such as effective water retention, efficient drainage and a range of desirable physical and chemical properties (Suthar *et al.,* 2021). Growing media

encompass substances such as soil, sand, FYM along with vermicompost which comprise combinations of constituents serving to supply water, air, nutrients and mechanical stability to plants. FYM, in particular, is composed partially of cow dung, urine, bedding and straw.An ideal growing medium offers ample anchorage and support to plants, acts as a reservoir for nutrients and water, facilitates the diffusion of oxygen to the roots and enables gaseous exchange between the root system and the substrate (Abad *et al.*, 2002). Growing media serves not only as a growth medium but also as a nutrient source for plant development. The composition of the media utilized directly impacts the quality of seedlings produced (Wilson *et al.,* 2001). The growing media plays a vital role in growth and development of any plant species and act as one of the growths influencing factors i.e., edaphic factor that act as precursor for initial stages of plant life. Vermicompost also known as worm castings, is a nutrient-rich organic material created by earthworms decomposing organic materials. It's a great natural fertiliser and soil supplement that promotes seed germination and seedling growth (Table 2). Nitrogen, phosphate, potassium and micronutrients are all abundant in vermicompost. It provides a natural and balanced source of nutrients that can promote the early stages of seed germination and seedling growth when utilised as a component of the growing medium. Vermicompost creates enormous surface area, providing strong absorbability and maintain nutrient for long period (Syamal*et al.*, 2021).

Presentstudy was conducted with combination of different growingwith soil as a control under glass house conditions for better germination and healthy seedlings.

**Material and methods**

The study was carried out in homogeneous condition in the glass house condition at Dr. Y.S. Parmar university of Horticulture and Forestry located at Nauni, Solan, H.P,India. The experimental site isat an altitude of 1270mabove msl at30˚52’N latitude and 76˚11’E longitude and falls under subtropical zone.

The disease-free plants of *Murrayakoenigii* were identified and marked after an initial survey from natural population of Himachal Pradesh. Ripened fruits (berries) were collected in the month of July. The berries were brought to the laboratory and the extraction of seeds was done manually by removing the mucilaginous substance by squeezing in water and then washing with water three to four times. Soil for media preparation was taken from the nurserysite . The soil was sandy loam in texture. Soil, sand, well decomposed farm yard

manure (FYM), vermicompost (VC) and cocopeat were mixed in proper proportions to get the requisite media (treatments) viz., soil (control), soil + FYM (2:1), Soil + Vermicompost (2:1), Soil + Coco peat (2:1)Soil + Sand + FYM (1:1:1), Soil + Sand + Vermicompost (1:1:1) and Soil + Sand + Coco peat (1:1:1).The experiment was replicated thrice and was laid in CRD design. Ten seeds per pot were sown uniformly to a depth of one cm in each treatment. The pots were watered and weeded regularlyas perrequirement. Observations were recorded on Germination percentage (%), Initiation of germination (days), Completion of germination (days), Mean daily germination (%), Peak value, Germination value, Seedling root length (cm) and Seedling shoot length (cm). The data was analysed using the technique of variance (ANOVA) in accordance with procedure outlined by Gomez and Gomez (1984). The effect of different treatments was tested at 0.05 level of significance. Further the morphological and seed germination studies were conducted both in the field and under laboratory conditions. Qualitative and quantitative parameters of *Murrayakoenigii*were studied on the basis of description of the plant given by Raju *et al.* (2022); Raghu (2020) and Sharma *et al.* (2011).

## RESULTS AND DISCUSSION

Data presented in Tables 1, 2 and 3 revealed that different growing media exhibited significant effect on initiation of germination, completion of germination, germination %, peak value, mean daily germination, seedling root and shoot length in *Murrayakoenigii*.

The growing media of (Soil + Sand + Vermicompost) in ratio (1:1:1) in treatment $T_6$ exhibited maximum value for seed germination and growth parameters viz., maximum germination percentage (86.00 %), early initiation of germination (10.00 days), early completion of germination (20.33 days), peak value (6.35), maximum mean daily germination (4.26 %), germination value (27.15), shoot length (17.60 cm) and seedling root length (18.90 cm). However, the minimum value for all germination and growth parameters was recorded in control ($T_1$).

**TABLE 1: Effect of different growing media on germination percentage, initiation of germination and completion of germination on *Murrayakoenigii*.**

| Treatments | Germination percentage | Initiation of germination | Completion of germination |
|---|---|---|---|

| | (%) | (days) | (days) |
|---|---|---|---|
| **$S_1$ - (Soil) Control** | 56.66(48.82) | 13.33 | 25.00 |
| **$S_2$ - Soil + FYM (2:1)** | 60.00(50.74) | 11.67 | 23.00 |
| **$S_3$ - Soil + Vermicompost (2:1)** | 66.66(54.76) | 11.33 | 21.00 |
| **$S_4$ - Soil + Coco peat (2:1)** | 73.33(58.98) | 11.00 | 22.33 |
| **$S_5$ - Soil + Sand + FYM (1:1:1)** | 76.66(61.19) | 10.88 | 20.67 |
| **$S_6$ - Soil + Sand + Vermicompost (1:1:1)** | 86.66(68.82) | 10.00 | 20.33 |
| **$S_7$ - Soil + Sand + Coco peat (1:1:1)** | 80.00(63.40) | 10.67 | 21.71 |
| **$CD_{0.05}$** | **8.62(5.77)** | **0.86** | **1.39** |
| **SE(m)** | **2.81(1.88)** | **0.28** | **0.45** |
| **SE(d)** | **1.87(2.66)** | **0.39** | **0.64** |

*Values in parathesis are arc sine transformed values

**TABLE 2: Effect of different growing media on peak value, mean daily germination and germination value on *Murrayakoenigii*.**

| Treatments | Peak Value | Mean daily germination (%) | Germination value |
|---|---|---|---|
| **$S_1$ - (Soil) Control** | 3.09 | 2.27(1.80) | 7.02 |
| **$S_2$ - Soil + FYM (2:1)** | 3.67 | 2.61(1.90) | 9.60 |
| **$S_3$ - Soil + Vermicompost (2:1)** | 3.70 | 3.17(2.04) | 11.77 |
| **$S_4$ - Soil + Coco peat (2:1)** | 4.08 | 3.28(2.07) | 13.38 |
| **$S_5$ - Soil + Sand + FYM (1:1:1)** | 4.79 | 3.70(2.16) | 17.72 |
| **$S_6$ - Soil + Sand + Vermicompost (1:1:1)** | 6.35 | 4.26(2.29) | 27.15 |
| **$S_7$ - Soil + Sand + Coco peat (1:1:1)** | 5.45 | 3.87(2.20) | 21.19 |
| **$CD_{0.05}$** | **0.66** | **0.37(0.09)** | **3.80** |
| **SE(m)** | **0.21** | **0.12(0.03)** | **1.24** |
| **SE(d)** | **0.30** | **0.17(0.04)** | **1.75** |

*Values in parathesis are square root transformed values

**TABLE 3: Effect of different growing media on seedling shoot length and seedling root length on *Murrayakoenigii*.**

| Treatments | Seedling shoot | Seedling root |
|---|---|---|

| | | length(cm) | length(cm) |
|---|---|---|---|
| **$S_1$ - (Soil) Control** | | 14.22 | 14.55 |
| **$S_2$ - Soil + FYM (2:1)** | | 15.33 | 15.87 |
| **$S_3$ - Soil + Vermicompost (2:1)** | | 13.63 | 15.77 |
| **$S_4$ - Soil + Coco peat (2:1)** | | 17.17 | 16.87 |
| **$S_5$ - Soil + Sand + FYM (1:1:1)** | | 17.03 | 17.83 |
| **$S_6$ - Soil + Sand + Vermicompost (1:1:1)** | | 17.60 | 18.90 |
| **$S_7$ - Soil + Sand + Coco peat (1:1:1)** | | 17.13 | 18.22 |
| **$CD_{0.05}$** | | **0.55** | **0.32** |
| **SE(m)** | | **0.41** | **0.35** |
| **SE(d)** | | **0.58** | **0.50** |

**Control** | **Soil + Sand + Vermicompost (1:1:1)**

**Effect of growing media {Soil + Sand + Vermicompost (1:1:1)} on germination and seedling growth of *Murrayakoenigii* (L.) Spreng in comparison with control**

Vermicompost is rich in beneficial microorganisms such as bacteria and fungi, which aid in nutrient cycling and promote a healthy soil environment. These bacteria can help break down organic debris and make nutrients more available to plants.Vermicompost includes

growth-promoting substance such as plant hormones and enzymes that can boost root formation and overall plant growth. Cocopeat also known as coir fiber pith or coir dust is a natural and renewable resource produced from coconut husks. Cocopeat is a multipurpose soil conditioner and growing medium. It increases the porosity of the potting mixture. As a result, the soil will become airier and looser, which helps in root growth more effectively. The plants porosity capacity facilitates the maintenance of its water capacity.

Fresh seed having good vigour and moisture in early stage and media provide good moisture, aeration and water holding capacity which might shorten germination duration (Arvid *et al.*, 2015). Mixture of growing media vermicompost plays important role which contain plant growth regulating materials such as humic acid and plant growth regulators like auxin, gibberellins material, such as humic acid and cytokines which are responsible for seedling growth (Ramteke *et al.*, 2016). The superiority of soil + sand + vermicompost media in the present studies over other treatments could be attributed to the conductive effect of this medium mixture on water holding capacity, porosity, soil aeration and supply of substantial amount of nutrient specially nitrogen and micro nutrients for good root and shoot growth. Similar findings have been reported by Bhardwaj and Sood, (2016) where the supply of plant water and air to the growing plants can be greatly influenced by the physical composition of growing media which may further affect the anchorage, nutrient and water holding capacity of the medium. These characteristics directly influence the seedling emergence and vigor and consequently to seedling quality. The early germination of seeds may be due to the beneficial effects of the mixed media as they have better water retention capacity, porosity and soil aeration.

Further increase in height of seedling with Soil + Sand + vermicompost media might be due to the reason that it stimulates nutrient uptake especially nitrogen which has a role in the assimilation of numerous amino acids that all subsequently incorporated in proteins and nucleic acid which the most of the biochemical reaction occurs. Higher aeration porosity and water holding capacity ultimately increase the speed of seed emergence (Bhardwaj, 2013). Vermicompost possess higher nutrient content than FYM (Sheikh and Dwivedi, 2017) and also reported to have bioactive principles which was considered to be beneficial for growth of plants. Zaller, (2007) and Ram, (2017) found higher content of available N, P and K in the soil + sand + vermicompost (1:1:1) than soil + sand + FYM (1:1:1). This might have also accelerated the growth of seedling in the present study.

The potting media of soil + sand + vermicompost (1:1:1) significantly influenced the studied parameters which may be attributed to better porosity and higher nitrogen content

occurring in vermicompost in this medium than that of the remaining media. These studies are in agreement with the finding of Sharma *et al.* (2023) in *Murrayakoenigii*, Sood *et al.* (2018) in *Terminalia bellirica* and Devamavadgi*et al.* (2010) in different tree species (*Acacia nilotica*, *Albizia lebbeck*, *Dalbergia sissoo*, *Gliricidiasepium*, *Inga dulce* and *Azadirachta indica*).

**References**


Abad M, Noguera P, Puchades R, Maquieira A and Noguera V. 2002. Physico-chemical and chemical properties of some coconut coir dusts for use as a peat substitute for containerised ornamental plants. *Bioresource Technology***82** :241-5.

Ahluwalia V., Sisodia R., Walia S., Sati O.P., Kumar J., Kundu A., 2004. Chemical analysis of essential oils of Eupatorium adenophorum and their antimicrobial, antioxidant and phytotoxic properties. J. Pest Sci, 7:341–349.

Arvind K, Ritesh, Patel K M and Upadhyay N V. 2015. Effect of different growing media and containers on germination and establishments of seedlings of papaya (*Carica papaya* L.) cv. Madhu bindu. *Trends in Biosciences***8**:227-35.

Bhardwaj R and Sood M. 2016. Effect of field conditions and time of sowing on seed germination and growth parameters in *Rheum australe* D. Don: an endangered medicinal plant of high-altitude Himalayas. *Medicinal Plants***8**: 171–75.

Devamavadgi S B, Wali S Y, Patil SB, Jambagi M B and Kambrekar D N. 2010. Effect of nursery mixtures on nutrient content and quality parameters of seedlings of different tree species. *International Journal of Agricultural Sciences***6**: 365–69.

Gomez KA and Gomez AA 1984.Statistical Procedures for Agricultural Research. John Wiley and Sons, Now York, U.S.A.

Nayak, S., 2006. Influence of Ethanol Extract of Vinca rosea on Wound Healing in Diabetic Rats. Online Journal of Biological Sciences, 6(2): 51-55.

Ram J. 2017. Effect of plant container size and potting media on the growth and development of *Oroxylum indicum* Vent. seedlings. M.Sc. thesis, Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu, Jammu and Kashmir, India.

Ramteke V, Paithankar D H, Manohar M B and Kurrey V K. 2016. Impact of GA3 and propagation media on growth rate and leaf chlorophyll content of papaya seedlings. *Research Journal of Agricultural Science* **7**:169-71.

Samsam, S.H., Moatar, F., 1991. Natural medicines and plants. Mashal Publications Tehran,123-130.

Sangam, S., Naveed, A., Athar, M., Prathyusha, P., Moulika, S., and Lakshmi, S., 2015. International Journal of Health Sciences and Research 5(1), 156–164

Sharma R, Raina N S and Sood K K. 2023. Nursery Performance of from Seed in Relation *Murrayakoenigii* to Potting Media and Hormonal Treatment of Branch Cuttings. *Indian journal of ecology***50**:54-59

Sheikh M A and Dwivedi P. 2017. Physico-chemical parameters of organic manure, soil and impact of organic manure and NPK fertilizer on seed germination of soybean and wheat. *International Journal of Engineering Technologies and Management Research***12**:118-30.

Sood K K, Ahmed F and Raina N S. 2018. Effect of container and growing media on Roxb. seedling *Terminalia bellirica* performance under nursery conditions. *Indian Journal of Ecology***45**: 270-75.

Suthar D P, Kotecha A V and ThounaojamA S. 2021. Effect of growing media and gibberellic acid on seed vigour and survival of acid lime (*Citrus aurantifolia* Swingle.) cv. Kagzi lime. *International Journal of Chemical Studies* **9**:291-93

Syamal M R, Katiyar and Joshi M. 2012. Performance of wedge grafting in guava under different growing conditions. *Indian Journal of Horticulture***69**:424-27.

Wilson S, Stoffella P and Graetz D. 2001. Use of Compost as a Media Amendment for Containerized Production of Two Subtropical Perennials. *Journal of Environmental Horticulture* **19**.

Zaller G J. 2007. Vermicompost as a substitute for peat in potting media: Effects on germination, biomass allocation, yields and fruit quality of three tomato varieties. *Scientia Horticulturae***112**:191-99.